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ABSTRACT

Testing 1-2-3 is a general purpose testing system developed at the Computer-Based Education Research Laboratory at the University of Illinois for use on NovaNET computer-based education systems. The testing system can be used for: short, teacher-made quizzes, individualized examinations, computer managed instruction curriculum testing, standardized tests, certification tests, and practice examinations. This system currently supports four test item types: multiple choice, multiple selection, short answer, and numeric. Options for result reporting include overall pass/fail scores, individual criteria for up to 26 subscores, and storage and viewing of a student's complete test history. Testing 1-2-3 is structured around several lists of component parts in a single file. Each test is created by specifying which parts will be combined to create a particular test. This guide discusses the following topics: (1) getting started; (2) creating test items; (3) the text mode; (4) the graphics mode; (5) the locate mode; (6) editing displays; (7) shared graphic resources; (8) making section pages; (9) gathering items into tests; (10) customizing tests; (11) testing under the SYS 4 Management System; and (12) assigning tests to students. Sample computer visual displays are illustrated in 22 figures. (SLD)

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TESTING 1 2 3

Test Development and Delivery System

ED324339

User's Guide
to the
Testing 1-2-3
Test Development and Delivery System

Ethan A. Edwards

Courseware & Curriculum Applications
Computer-based Education Research Laboratory
University of Illinois at Urbana-Champaign

August 1990

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USER'S GUIDE
TO THE
TESTING 1-2-3
TEST DEVELOPMENT AND DELIVERY SYSTEM

Ethan A. Edwards

Courseware & Curriculum Applications Group
Computer-based Education Research Laboratory
University of Illinois at Urbana-Champaign

August 1990

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at Urbana-Champaign

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Overview of Testing 1-2-3™

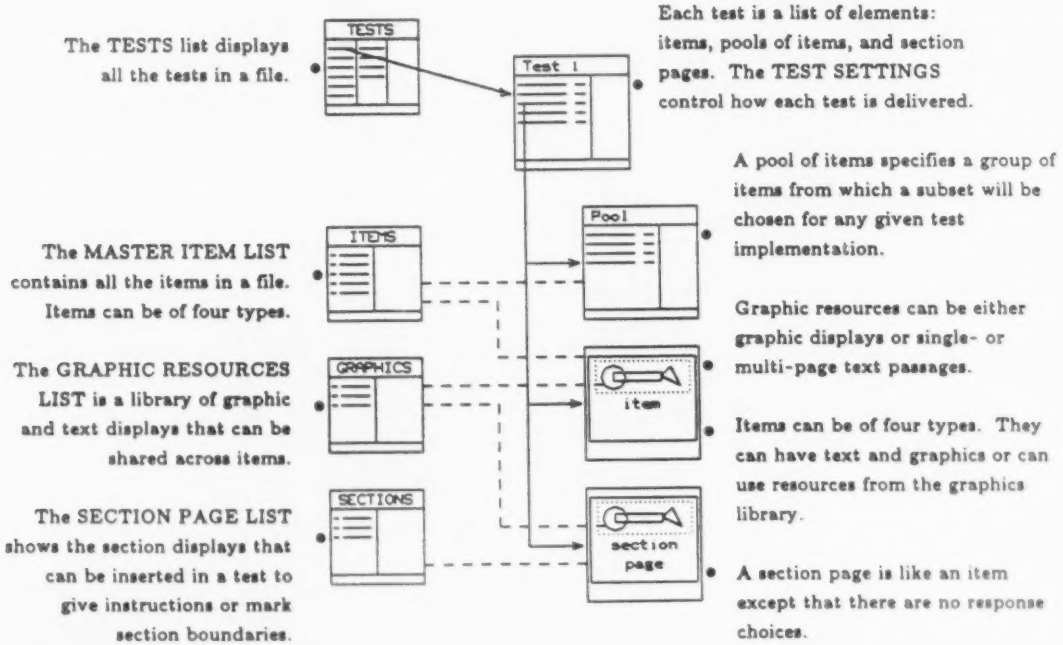
Testing 1-2-3 is a general purpose testing system developed by the CERL Courseware & Curriculum Applications Group at the University of Illinois for use on NovaNET® computer-based education systems. Designed to be suitable for a wide range of applications, *Testing 1-2-3* can be used for

- short, teacher-prepared quizzes
- individualized examinations
- CMI curriculum testing
- standardized tests
- certification tests
- practice examinations

Result reporting options include overall pass/fail, scores, individual criteria for up to 26 subscores, and storage and viewing of a student's complete test history.

Organization of Testing 1-2-3

Testing 1-2-3 is structured around several lists of component parts contained in a single file. Each test is created by specifying which of these parts will be combined to form a particular test.


The TESTS list displays all the tests in a file.
TESTS
Test 1
Each test is a list of elements: items, pools of items, and section pages. The TEST SETTINGS control how each test is delivered.
A pool of items specifies a group of items from which a subset will be chosen for any given test implementation.
Pool
The MASTER ITEM LIST contains all the items in a file. Items can be of four types.
ITEMS
The GRAPHIC RESOURCES LIST is a library of graphic and text displays that can be shared across items.
GRAPHICS
Graphic resources can be either graphic displays or single- or multi-page text passages.
item
Items can be of four types. They can have text and graphics or can use resources from the graphics library.
The SECTION PAGE LIST shows the section displays that can be inserted in a test to give instructions or mark section boundaries.
SECTIONS
section page
A section page is like an item except that there are no response choices.

Tests

The Tests List displays all the tests contained in a file. Each test file can contain up to 60 tests. A test can be any combination of items, item pools, and section pages. Item pools are created within a test. Each pool is a group of items selected from the Master Item List. Usually, they represent a set of equivalent items. Whenever a test is delivered, a subset of those items will be administered. Pools make it possible to administer alternate versions of the same test. Test Settings and Pool Settings specify how the test will be administered through options that control sequencing, review, scoring, timing, and other features of the test.

Items

The Master Item List displays all the test items contained in the file. *Testing 1-2-3* currently supports four item types: Multiple Choice, Multiple Selection, Short Answer, and Numeric. Items can include graphics in item stems and in response choices. The complexity of the questions and number of response choices are primarily limited by what will fit on a single screen. Open-ended questions (short answer text and numeric) allow for multiple correct answers; numeric items include an option to specify a judging tolerance. Special answer/ordering options control ordering options and, for open-ended items, judging parameters on an item-by-item basis.

Sections

The Section Page List specifies all the section pages that are available for use in any of the tests in the file. The list is structured like the Master Item List, and individual section pages are assigned a number and name. Section pages are displays that can be inserted anywhere in a test. There are two main uses for section pages. First, a section page can be used to give supplementary instructions or additional information related to a set of items that follow it. Second, they can be used to delineate sections of a test, and then review capabilities can be linked to these sections (i.e., the student can review items freely within a section, but once a new section is started, answers to questions in the previous section can no longer be changed). Section pages can include text and graphics.

Graphics

The Graphic Resources List manages the library of text or graphic elements that may be shared across items. These might include complex graphic displays to be used with many items, or reading passages for which the student must answer several questions (the reading passages themselves can span several pages). Graphic resources are listed and identified the same way as items and sections. They are created using a similar editor and can contain both text and graphic elements. Graphic resources always appear at the top of the item or section display.

Getting Started

Note: The following instructions apply to creating any sort of test. There are additional guidelines relating to SYS 4 tests. If you are creating tests for use in SYS 4, be sure to read the section SYS 4 Tests *on page 41.*

Creating a Test File

To create *Testing 1-2-3* tests, you must have a test form file. You or your account director will create a test file using the NovaNET accounts system. You will need a **nameset** with 64-word records and 20-character names.

The number of names and records needed will depend on the nature of the tests you intend to write. Use these guides as an estimate of how many names and records you'll need:

# of names = sum of the number of tests, pools, items, sections, and graphics

# of records = estimated number of names needed PLUS the number of multiple choice and selection items multiplied times the average number of choices per item.

For example, suppose you want to create three tests; each test will contain four item pools and one section page; in all there will be 50 short answer questions and 50 multiple choice questions with four responses each; these items will use 10 graphic resources. Your nameset should have at least:

```
  3 tests
 12 pools (4 per test)
  3 sections (1 per test)
100 items
+ 10 graphics
128 names
```

and

```
  128 names needed (estimated above)
+ 200 responses (4 per multiple choice item)
  328 records
```

Of course, these estimates are inexact. The actual number of records needed will depend on the complexity of the items and displays. Test files can be lengthened or shortened at any time. When the item bank is stable and when changes to it will be infrequent, the data can be put into compressed format, which will significantly reduce the file space needed.

File Information

Before using this file as a *Testing 1-2-3* test file, you must specify some file information. The Processor Lesson should be set to *xtster* with read/write (rw) access. You must also enter a typable *write records* code and a *read records* code. These codes must be typed each time you want to edit or inspect items in the test file.

Entering the Testing 1-2-3 Test Editor

Lesson *tstedit* provides access to the *Testing 1-2-3* test editor. Follow these steps to edit tests:

1. Type *tstedit* at the Author Mode page; press DATA. You will be taken to the *Testing 1-2-3* title page (Figure 1).

2. Enter the test file name; press NEXT.

3. Type a codeword; press NEXT. If you want to change items or tests in the file, type the *write records* code; to inspect the items and tests in the file, type the *read records* code.

If you have appropriate access to the test file, you will be taken to the *Testing 1-2-3* main menu (Figure 2). This menu provides access to all the lists that organize the tests, sections, graphics, and items contained in your test file.

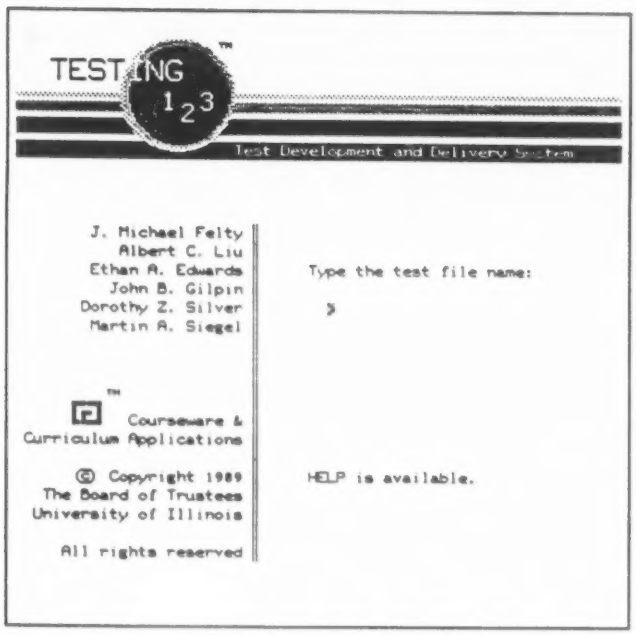


Figure 1. **Title Page**

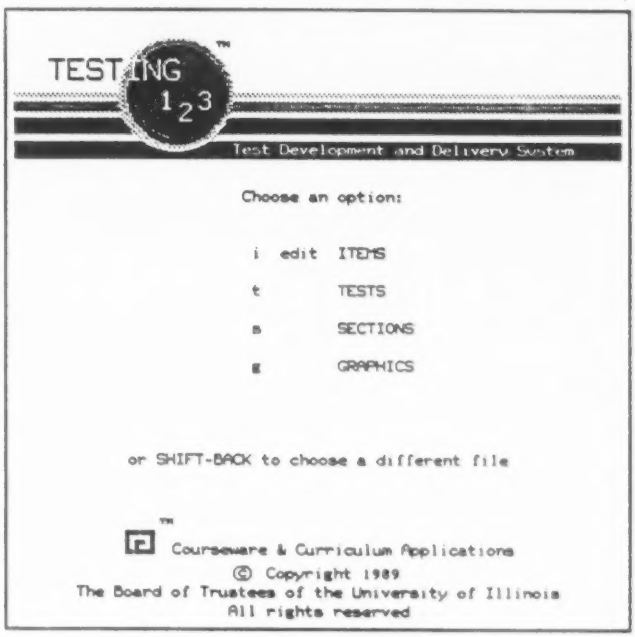


Figure 2. **Main Menu**

Creating Test Items

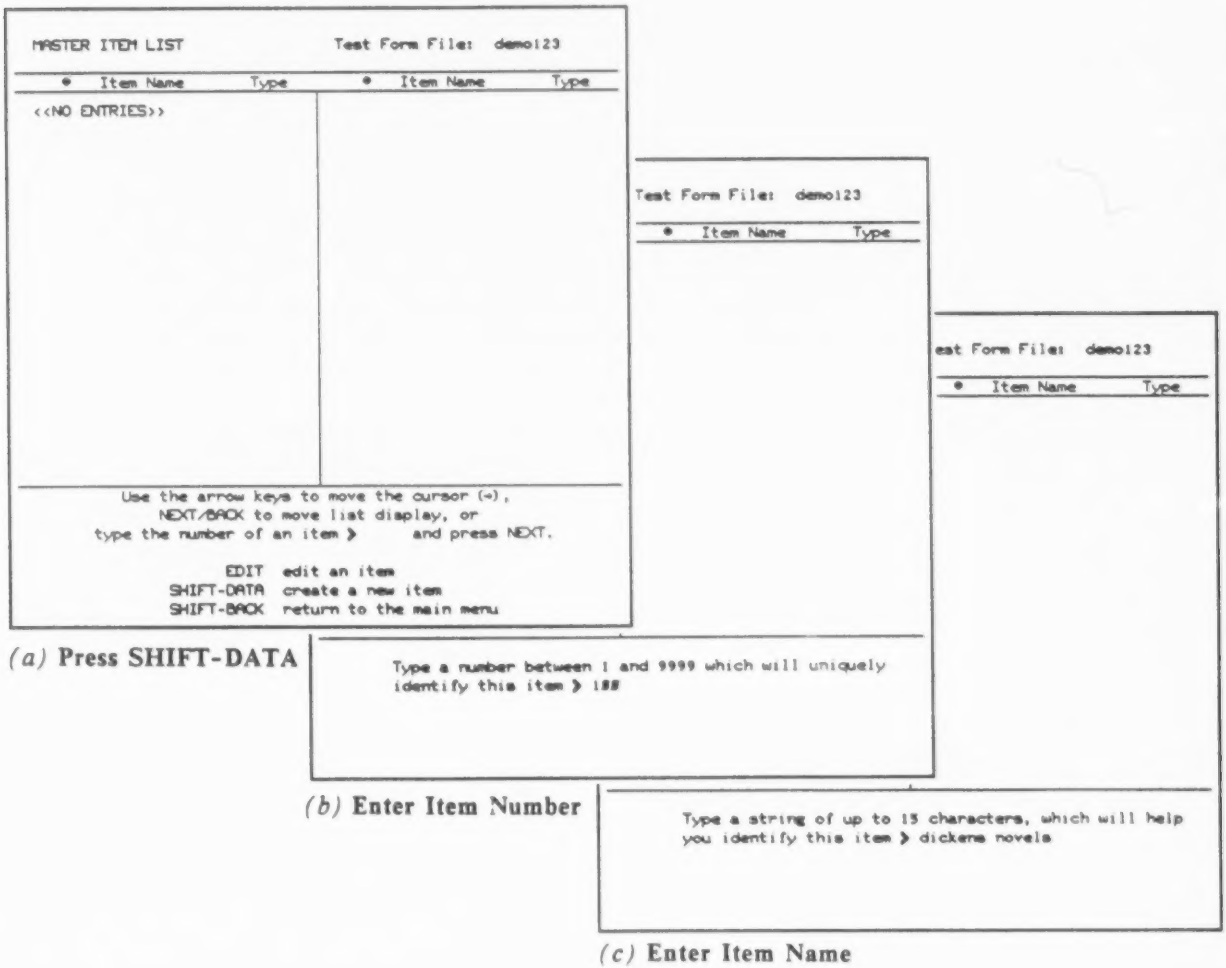
The Master Item List

All the items in a test file are organized together in the Master Item List. Option "i" (edit ITEMS) from the main menu takes you to this list. When you see this display for the first time, the list will be empty, since you haven't created any items.

Specifying a New Item

To initialize and set up space for a new item:

1. press SHIFT-DATA while viewing the Master Item List (Figure 3a),
2. type an item number and press NEXT (Figure 3b).


MASTER ITEM LIST
Test Form File: demo123
• Item Name Type
• Item Name Type
<<NO ENTRIES>>
Use the arrow keys to move the cursor (→),
NEXT/BACK to move list display, or
type the number of an item ❯ and press NEXT.
EDIT edit an item
SHIFT-DATA create a new item
SHIFT-BACK return to the main menu
Test Form File: demo123
• Item Name Type
eat Form File: demo123
• Item Name Type
Type a number between 1 and 9999 which will uniquely identify this item ❯ 188
Type a string of up to 15 characters, which will help you identify this item ❯ dickens novels

(a) **Press SHIFT-DATA**

(b) **Enter Item Number**

(c) **Enter Item Name**

Figure 3. **Specifying a New Item**

Items in *Testing 1-2-3* are identified by a unique 4-digit number. Item numbers can range from 1 to 9999. Items are listed in numeric order in the Master Item List, but numbers do not have to be assigned consecutively. Since the item numbers determine the order in which items are listed, choose a numbering system that will provide a useful organization.

For example, if a test file will contain items on reading, language, and spelling, you might assign numbers so that all the reading items fall in the range 1000-1999, language items in the range 2000-2999, and spelling items in the range 3000-3999. Planning an organization for the item list will facilitate the process of building tests later.

3. type an item name; press NEXT (Figure 3c).

In addition to the unique item number, each item also has a 15-character name. These names can be anything you choose and the same name can be used for many items. The name is not used to identify items inside the *Testing 1-2-3* programs; it is just another label to help you organize the items in the test file.

4. select item type (Figure 4).

Select the type of item you wish to create by pressing the appropriate letter. This item type selection can be changed anytime before you enter the response choices. Once an item is complete, you cannot change its item type.

Figure 4. **Select Item Type**

Item Parts

Each item display consists of two basic parts: the item stem and one or more responses (Figure 5). The stem is the part of the item that states the question or provides item-specific instructions. The responses are the means by which the student gives an answer.

For multiple choice and multiple selection items, the choices are lettered and spaced automatically as they are entered. For short answer formats, each correct alternative answer is entered separately.

The item editor makes some assumptions about the user and the characteristics of most items: 1) the user will enter the item stem, enter the response choices, and then mark the correct answer; and 2) most items and responses will not contain graphics. The editor is organized so that creating items that match these assumptions is as easy as possible.

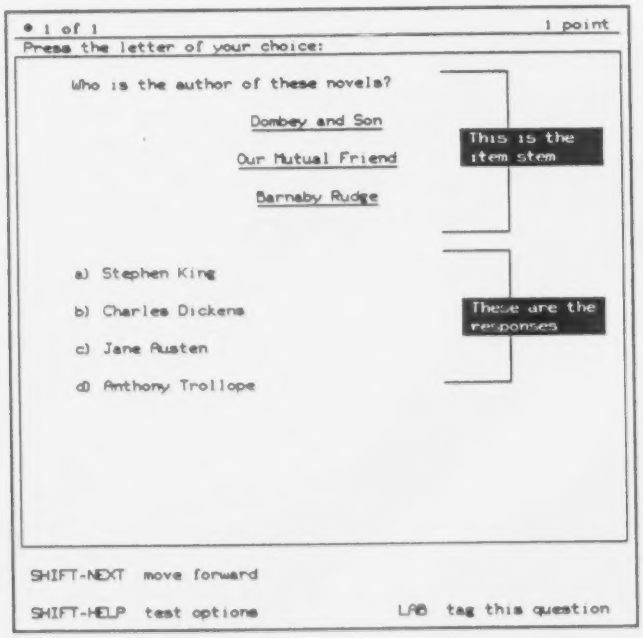


Figure 5. **Item Parts**

Entering the Item Stem

Every *Testing 1-2-3* item must contain a *stem*. The stem is displayed directly before the response choices. The stem can consist of either text or graphics (lines, boxes, circles, etc.) or a combination. See the sections *Text Mode* on page 15 and *Graphics Mode* on page 17 for specific instructions on using the *Testing 1-2-3* display editors.

Testing 1-2-3 assumes that the stem will be text and so when creating an item, you are taken directly to text input mode.

When you are finished with the stem, press SHIFT-NEXT. SHIFT-NEXT is used consistently within the editors to indicate that you are finished with what you are doing. Thus, when you are finished entering the item stem, pressing SHIFT-NEXT will store the stem and let you begin entering the first response.

Entering Responses

The procedure for entering reponses depends on the item type.

- **Multiple Choice and Multiple Selection** (Figure 6). For multiple choice and multiple selection items, each choice will be lettered and spaced for you automatically. Each response choice can contain text, graphics, or a combination of both. See *Text Mode* on page 15 and *Graphics Mode* on page 17.

  After each response is completed, press SHIFT-NEXT to complete that response and begin entering the next responses. You can enter as many responses as can be displayed on the screen.

  To stop entering responses, press SHIFT-BACK *OR* press SHIFT-NEXT by itself before entering anything at a new response prompt.

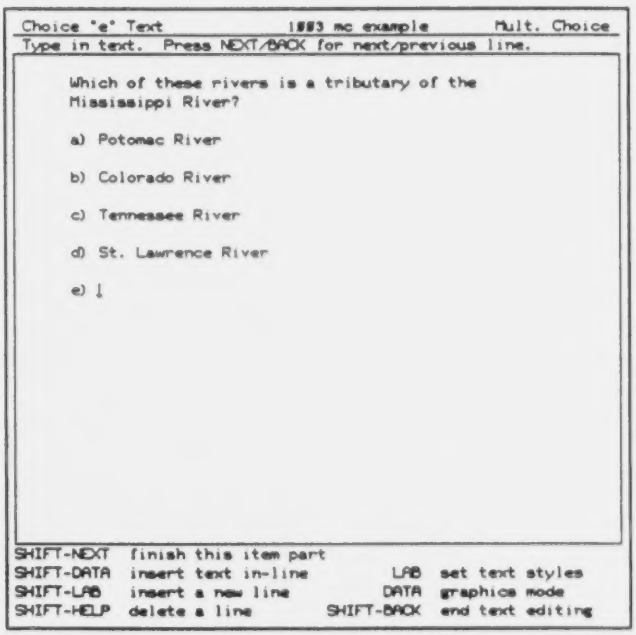

Choice "e" Text
1-2-3 mc example
Mult. Choice
Type in text. Press NEXT/BACK for next/previous line.
Which of these rivers is a tributary of the Mississippi River?
a) Potomac River
b) Colorado River
c) Tennessee River
d) St. Lawrence River
e)
SHIFT-NEXT finish this item part
SHIFT-DATA insert text in-line
LAB set text styles
SHIFT-LAB insert a new line
DATA graphics mode
SHIFT-HELP delete a line
SHIFT-BACK end text editing

Figure 6. **Multiple Choice Item**

- **Short Answer** (Figure 7). After entering the stem for short answer items, you must enter each alternative correct response. At the arrow, type the string of characters that the student's answer should match. You can enter several correct responses. Press SHIFT-NEXT after each alternative response.

  When you are finished, press SHIFT-BACK *OR* press SHIFT-NEXT by itself at the input arrow before typing any characters.

Anticipated Response 4 1884 sa-t example Short Text
Type in the anticipated response.
There are four states whose capital city is named after a former president of the United States.
What is one of those states?
• Mississippi
• Missouri
• Nebraska
› Wisconsin
SHIFT-NEXT store
SHIFT-BACK exit
BACK keep what was there
SHIFT-HELP delete

Figure 7. **Short Answer Item**
Any of the listed answers will be accepted as correct.

- **Numeric** (Figure 8). Numeric items are very similar to short answer text items. The principal difference is that you are entering a *value* which the student's answer should equal, rather than a specific string of characters.

  You can enter either an expression (e.g., 2 + sin(40)) or a specific value (e.g., 25) as the correct answer. If you type a mathematical expression, it will be evaluated, and that value will be displayed when you press SHIFT-NEXT.

  The student's response has to match the correct answer *exactly*. In cases where this requires greater accuracy than is required, you can include a range of tolerance. The range (either an absolute number or a percentage) is entered immediately after the correct answer. The two values are separated by a comma.

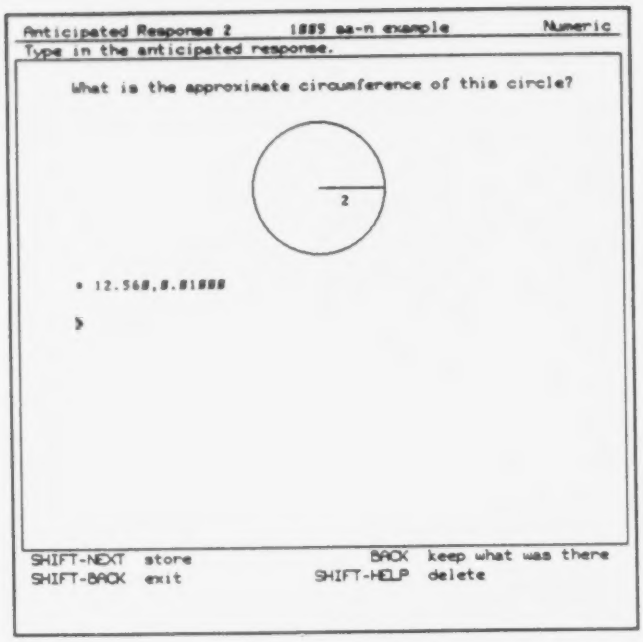


Figure 8. **Numeric Item**
The first number is the value to be matched;
the second number specifies the tolerance.

Specifying the Answer

After the parts of the item are complete, you must specify the correct answer and/or judging parameters. The options and procedures differ for each item type.

Press LAB to access the answer/ordering or response judging options. Then, follow the instructions described below for each item type.

- **Multiple Choice.** When you press LAB, you can specify the correct answer (Figure 9a). Press the letter of the correct choice; a '*' will appear beside that choice. To change the selection, press another letter; the '*' will move to the new selection.

  Press LAB again to set the other answering parameters (Figure 9b). To change any of the following parameters, press the underlined capital letter in each label.

  Order of choices. The response choices can be displayed in the **fixed** order in which they were entered, or the order can be **random** each time the item is displayed. Press *O* to switch between these two settings. The default setting is **random.**

  Choices to randomize. If the order of choices is set to random, you can specify how many of those choices should be randomly arranged. Select this option by pressing *C*. You will be asked for a number of choices to randomize. For example, if your question has four response choices, and you specify that three should be randomized, choices a, b, and c will be rearranged

each time the item is displayed; whatever is entered as choice d will always be displayed at that position. This feature is useful when you have special response choices that should always appear after the other choices (e.g., "Not enough information").

You can also add two special choices for each item:

All of the above and **None of the above.** Press *A* and/or *N* to add these special choices. If either of these are selected, they will be added to the item. The randomization will be set so that they will always appear as the last choices (and "All of the above" will precede "None of the above," if both choices are present).

Answer Specification 1##3 mc example Mult. Choice
Press the letter of the correct choice.
Which of these rivers is a tributary of the Mississippi River?
a) Potomac River
b) Colorado River
* c) Tennessee River
d) St. Lawrence River
LAB for ordering options and special choices
SHIFT-BACK to exit
1##3 mc example Mult. Choice
nge that parameter. SHIFT-BACK when done.
Order of choices: random
Choices to randomize: all
Special choices -
All of the above: no
None of the above: no

(a) **Specify answer**

(b) **Ordering options**

Figure 9. **Answer/Ordering Options for Multiple-Choice Items**

- **Multiple Selection.** Answer and ordering settings for multiple selection items are nearly identical to multiple choice items. When you press LAB, you can specify the correct answer by pressing the letter of the correct choices; a '*' will appear beside each choice. You can mark as many correct responses as you wish. To cancel a selection, press the letter of that choice; the '*' will be removed.

  Press LAB again to set the other answering parameters. All options work similarly to the options for multiple choice. The principal difference is that there is no special choice for "All of the above."

- **Short Answer.** For short answer items, there's no need to mark a *correct* answer, since each alternative response you enter in the item is correct. When you press LAB for response judging, you can modify the judging parameters (Figure 10).

  Length of response. Selecting this option (by pressing *L*) allows you to set a limit for how many characters to allow in the student's typed response. Most important, make sure that your setting allows enough space for the correct answers you have entered. (Remember that SHIFT-ed characters take up the space of two characters when you figure out how much space you should allow.) It becomes important that this space is not too long if you intend to store student answers for later viewing (as in *SYS 4*). The default value is 19 characters.

  Ignore Blanks. This option allows you to specify whether blanks should be ignored when judging the answer. Press *B* to toggle this setting between **yes** and **no**. This feature is useful in situations in which the answer may include symbols rather than words (e.g., if the answer were "x + 2y - 4z", it would make sense to ignore any blanks included in the student's response.)

Locate Mode
1884 sa-t example
Short Text
Press a letter to change that parameter. SHIFT-BACK when done.
There are four states whose capital city is named after a former president of the United States.
What is one of those states?
* Mississippi
* Missouri
* Nebraska
* Wisconsin
Length of response (in characters): 19
Ignore Blanks: no
Accept mistakes in -
Capitalization: no
Spelling: no

Figure 10. **Short Answer Response Judging**

Accept mistakes in Capitalization. Select this option by pressing *C*. When this option is in effect, students can capitalize words in their answers and still have the answer judged correct, even if they were not capitalized in the correct answer specified in the test. This only applies to capitalizing the first letter of words. This tolerance only works one way (i.e., lower case words in the specified answer may be capitalized in the student's response and still be counted correct; words capitalized in the specified correct answer MUST be capitalized in the student's response). So, if you want to allow answers to be acceptable whether they are capitalized or not, enter the words as answers in lower case and then set this option to allow mistakes in capitalization.

Accept mistakes in Spelling. When this option is selected (by pressing *S*) the built in NovaNET spelling algorithms will check the student's response for a probable misspelling of the specified correct answer and makes a good guess about the student's typing accuracy, in terms of number of vowels, number of consonants, arrangement of letters, and number of syllables. If absolute accuracy is very important, don't use this option.

- **Numeric.** Numeric items have a small number of judging options:

  Length of response. As in short answer items, you can specify an allowable length for the student's answer. The default length is nine characters.

  Allow typing of Operators. If you set this option to **no**, student responses that use arithmetic operators (+,-,x,/) will not be evaluated.

Returning to the Master Item List

After the parts of the item are complete and you have set the answering options appropriately, press SHIFT-BACK. You will be returned to the Master Item List. (If you try to leave a multiple choice or multiple selection item without marking an answer, you will be given an opportunity to mark the answer before going to the list.)

The item you just created should be listed and is ready to be included in a test. For each item in the list, the item number, item name, and type are displayed.

Other Options from the Master Item List

As you build a body of items in your test file, the Master Item List will expand and require several screens to display all the items. Displayed along the left side of the lists is an item indicator—a rightward-pointing arrow. This indicator is what you control to move around in the list.

You will use the NovaNET cursor movement keys to move this indicator. Figure 11 shows these direction keys. (*Note: The arrow keys found on personal computer keyboards will NOT work in place of the NovaNET cursor keys.)*

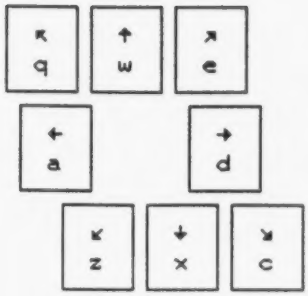


Figure 11. **NovaNET Cursor Movement Keys**

To move the indicator to the next item, press *a*; to move to the previous item, press *w*; to move to the second column on the display, press *d*. If you press NEXT or BACK, you will move through the list a page at a time.

Several item options may be performed from the Master Item List. Press EDIT to access these options:

EDIT Edit an existing item. (See *Editing Displays*)

SHIFT-HELP Delete an item.

LAB Change the item name.

DATA Renumber an item.

SHIFT-COPY Make a copy of this item. (You will have to supply an item number and name for the copy.)

Text Mode

Text mode is the part of the *Testing 1-2-3* editor that allows you to enter lines of text (Figure 12). It is the default mode whenever you start to enter a stem or response choices (for multiple choice and multiple selection items).

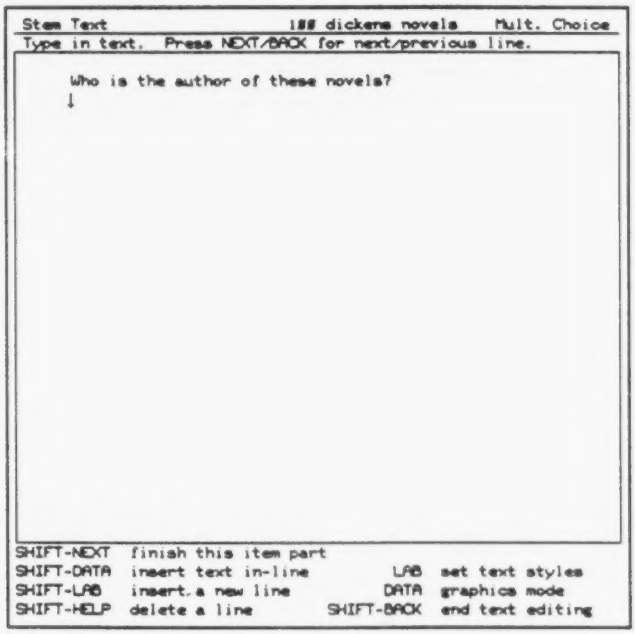

Stem Text 188 dickens novels Mult. Choice
Type in text. Press NEXT/BACK for next/previous line.
Who is the author of these novels?
SHIFT-NEXT finish this item part
SHIFT-DATA insert text in-line LAB set text styles
SHIFT-LAB insert a new line DATA graphics mode
SHIFT-HELP delete a line SHIFT-BACK end text editing

Figure 12. Text Mode

Text Cursor

Text mode is characterized by the special text cursor. (The text cursor is made up of a dotted vertical line and short crossbar.) This cursor indicates where text you type will be displayed on the screen.

Entering Text

As you type, the text characters appear on the line indicated by the text cursor. Press NEXT to move to a new line. Press NEXT without typing anything to insert a blank line. Press SHIFT-NEXT (if you want to go on to the next item part) or SHIFT-BACK to exit Text Mode.

Changing Text Styles

Testing 1-2-3 allows several special formats for text. To set text styles for some text, press LAB just when you would start typing the text. This will allow you to select any combination of several possible text formats. To choose an option, press the underlined

capital letter displayed with it. The text style options are listed below; possible settings for each option are listed in parentheses with the default setting underlined. Options marked with a '*' may not be available on all types of terminals. Figure 13 shows examples of the various styles.

Underline	Automatic text underlining. (**off, continuous**)
Thick	Bold text characters. (**off, on**)
Font	Alternative font styles. (**normal, shadow hollow**)
Color*	Foreground and background color. (**white, black, blue, green, red, magenta, cyan, yellow, page**) The default is listed as (**page/page**) which means that the color for this text will be whatever is set for the rest of the page.
Italics*	Italics text. (**off, on**)
Size	Text size. (0)
Rotation	Angle of rotation of text; size must be something other than 0. (0°)
Boxed	Boxed text. (**off, on**)
Mode	Sets text mode. (**write, inverse*, erase, rewrite**)

Press SHIFT-BACK to resume entering text. SHIFT-HELP will reset all settings to the default values.

Figure 13. **Text Styles**

Graphics Mode

Graphics mode is a flexible screen display editor. Graphics mode lets you position text and graphic displays exactly where you want them to appear on the screen.

Entering Graphics Mode

In most cases you will enter graphics mode from text mode. While in text mode, press DATA to switch to graphics mode (Figure 14). In a few cases (when there is no text in an item part) you will find yourself in graphics mode automatically if you try to edit that item part. (See *Locate Mode* on page 26.)

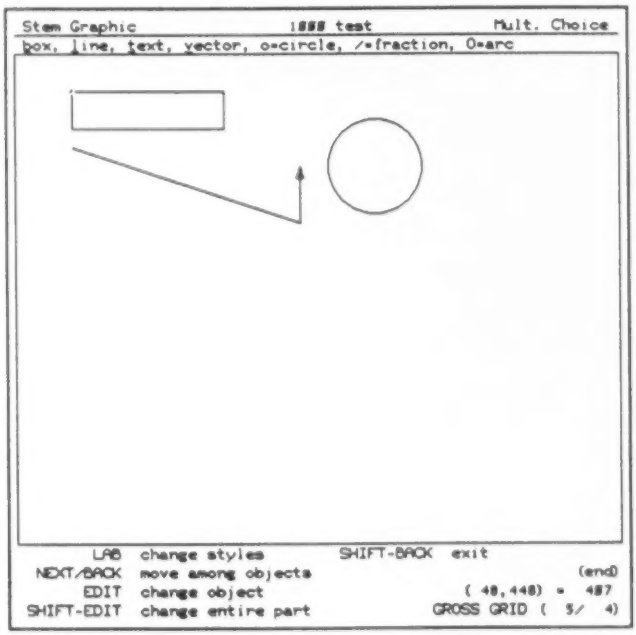


Figure 14. Graphics Mode

Features

One key feature of graphics mode is that you can position objects all over the screen, rather than just in text lines. The graphics mode cursor is a small plus sign (+). This cursor can be moved around the screen using the NovaNET arrow movement keys (Figure 11). Each time you press one of these keys, the cursor moves one space in that direction. The actual size of that space depends on the grid resolution. The screen grid may be *fine* or *gross*. In fine grid, the cursor moves one screen dot at a time. This allows accuracy but can be slow. In gross grid, the cursor moves roughly a space the size of regular text characters. For even bigger jumps, you can hold down the SHIFT key as you press the cursor movement keys; the cursor will make bigger jumps than normal for each grid resolution.

Key Conventions

Graphics mode lets you insert any of these objects: box, line, text, vector, circle, fraction, or arc. Each is described in detail below.

Although the details for each type of object may vary, the same basic procedure applies to creating objects of any type.

- The creation of any of the objects is initiated by pressing a single key. These keys are listed in the instructions at the top of the screen.
- SHIFT-NEXT is used to mark each point included in an object.
- Individual points within an object can not be moved after the object is created. However, the whole object can be moved as a single entity.
- Preview is available for all objects except text and fractions. To preview an object, move the cursor to where you would like to store a point, but instead of pressing SHIFT-NEXT, press *?* (question mark). The object will be drawn for you. You can either press SHIFT-NEXT to store that item, or you can continue moving the cursor around to look for a different display location.
- If in the middle of inserting a graphic object you decide you don't want to complete the object you are drawing, press SHIFT-BACK to exit. The object will not be drawn.

Boxes

To create a box:

1. move the cursor to where you want one corner of the box to be.
2. press *b*.
3. move the cursor to the opposite corner of the box.
4. (optional) press LAB to change the thickness of the box to be drawn; type the thickness (positive numbers add thickness to the outside of the box; negative numbers add thickness to the inside of the box).
5. (optional) press *?* to preview the box.
6. press SHIFT-NEXT to add the box to the display.

Lines

To draw lines:

1. move the cursor to the beginning location of the line.
2. press *l*.
3. move the cursor to the end of the line.
4. (optional) press *?* to preview the placement of the line.
5. press SHIFT-NEXT to add the line to the display.
6. to continue drawing connected lines, go back to step #3.
7. to draw a new line starting from a different point, go back to step #1.
8. press SHIFT-BACK to stop drawing lines and return to graphics mode.

All the lines you draw after pressing *l* for the first time and before you press SHIFT-BACK will be considered one entity. Thus, all these lines can be moved or deleted as a unit. To store the lines independently, press SHIFT-BACK after each line segment and then start again by pressing *l*.

Creating Text

To add text in graphics mode:

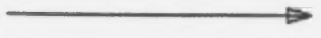
1. move the cursor to the upper left corner of the area where you want the text to appear. This location will specify the left margin for the text.
2. press *t*.
3. follow text entering instructions as described above in *Text Mode*.
4. when finished, press SHIFT-BACK or DATA to return to graphics mode.

Vectors

Adding vectors to a display is a convenient way to draw arrows. To create a vector:

1. move the cursor to where you want the *tail* of the vector to be.
2. press *v*.
3. move the cursor to where you want the arrow *head* to be.
4. (optional) press LAB to change the arrow size. The normal size is 10 dots; a larger number will result in a bigger arrow head. A negative number will produce an *open* arrow head (Figure 15).

(a) **Arrow Size = 15**



(b) **Arrow Size = 10**

(c) **Arrow Size = -10**

Figure 15. **Vector Arrow Sizes**

5. (optional) press *?* to preview the vector.
6. press SHIFT-NEXT to add the vector to the display.

Circles

To create a circle:

- move the cursor to where you want the center of the circle to be.
- press *o*.
- move the cursor to a point on the edge of the circle. (You are marking a radius of the circle.)
- (optional) press *?* to preview the circle.
- press SHIFT-NEXT to add the circle to the display.

Arcs

To create an arc:

- move the cursor to one end of the arc you wish to draw.
- press *O* (capital-O).
- move the cursor to the other end of the arc.
- press NEXT.
- move the cursor to a point on the arc between the two points you just marked.
- (optional) press *?* to preview the arc.
- press SHIFT-NEXT to add this arc to the display.

Fractions

Fractions can be very tedious to display appropriately on the screen. The special fractions input mechanisms removes much of the burden of sizing and spacing. This mechanism will let you create statements like:

$$4\frac{2}{3}$$
$$+\quad 1\frac{1}{6}$$

or

$$\frac{(a-y)\ (b+2y)}{y} \quad \times \quad \frac{y^2\ (b-y)}{2ab\ (b+y)\ (a+y)}$$

in a single step.

Each fraction consists of three parts: the whole number part, the numerator, and the denominator. In the fraction $4\frac{2}{3}$, 4 is the whole number part, 2 is the numerator, and 3 is the denominator.

When you enter *Testing 1-2-3* fractions, you will enter the fraction parts in that order. The whole number part will be displayed in larger text than the numerator and denominator. (The initial settings produce fractions with the whole number written in Size 2 text and the numerator and denominator written in Size 1 text.) The horizontal line in the fraction will be sized to correspond to the contents of the fraction. Both the numerator and denominator will be centered on this horizontal bar.

In the instructions that follow, you will be instructed at one point to type ACCESS-D or ACCESS-X (to type an ACCESS key combination, hold down the SHIFT-key and press the key marked with a square or equivalent key on your keyboard; then press the letter key). When you press ACCESS-D, a right arrow will be displayed; when you press ACCESS-X, a down arrow will be displayed. These arrows serve two purposes: 1) they mark the beginning of the numerator of the fraction, and 2) they determine where the next fraction will be displayed. If you are writing an expression involving several fractions and want them to be displayed in a horizontal line across the screen, insert the arrow that points across the screen (ACCESS-D); if you want the fractions lined up vertically, insert the arrow that points down the screen (ACCESS-X). If you are entering a single fraction, it doesn't matter which arrow you use.

To create a fraction:

1. move the cursor where you want the fraction to appear.
2. press /.
3. type the whole number part of the fraction.
4. type an arrow character (either ACCESS-D or ACCESS-X; see description above).
5. type the numerator.
6. type /.

7. type the denominator.

8. press either NEXT or SHIFT-NEXT. The screen formatting is done after either of these keypresses. If you want to add a second fraction, press NEXT and go back to step #3. If you have finished entering fractions, press SHIFT-NEXT to add the fractions to the display.

The following examples illustrate these steps:

Add this to an item display:

$$3\frac{1}{3}$$
$$+\ 1\frac{3}{4}$$

What you should type	What you'll see
[SPACE] [SPACE] 3	» 3
ACCESS-X	» 3↓
1/3	» 3↓1/3
	$3\frac{1}{3}$
NEXT	»
	$3\frac{1}{3}$
+ [SPACE] 1	» + 1
	$3\frac{1}{3}$
ACCESS-X	» + 1↓
	$3\frac{1}{3}$
3/4	» + 1↓3/4
	$3\frac{1}{3}$
SHIFT-NEXT	$+\ 1\frac{3}{4}$

Add this to an item display: $\frac{x^2+2x-3}{2} - \frac{x}{2x-1}$

What you should type	What you'll see
ACCESS-D	» →
$x^2+2x-3/2$	» →$x^2+2x-3/2$
NEXT	$\frac{x^2+2x-3}{2}$ »
[SPACE] - [SPACE]	$\frac{x^2+2x-3}{2}$ » -
ACCESS-D	$\frac{x^2+2x-3}{2}$ » - →
x/2x-1	$\frac{x^2+2x-3}{2}$ » - →$x/2x-1$
SHIFT-NEXT	$\frac{x^2+2x-3}{2} - \frac{x}{2x-1}$ +

Changing Graphics Styles

Testing 1-2-3 supports advanced graphics features, including those made possible by the Level One Protocol Program (L1PP). To set graphics styles, press LAB to change styles. You'll be shown several options. To choose any of them, press the underlined capital letter. The styles options are listed below; possible settings for each option are listed in parentheses with the initial setting underlined. Options marked with a * may not be available on all types of terminals.

Color*	Set foreground and background color. (**white, black, blue, green, red, magenta, cyan, yellow, page**) The default is listed as (**page/page**) which means that the color for the graphic objects will be whatever is set for the rest of the page.
Fill	Graphic objects will be filled using the current colors and pattern. (**off, on**)
Pattern	Specify a pattern number to use in graphics. Pattern numbers range from 0-31. (initial setting is 1)
Thick	Graphic objects will be drawn in lines of specified thickness; thickness should be odd integer values. (initial setting is 1)
Dash	Graphic objects will be drawn using dash styles. Dash styles are indicated by a number from 0-7. (initial setting is 1)
Mode	Sets display mode. (**write, inverse*, erase, rewrite**)

Press SHIFT-HELP to reset styles to initial settings. Press SHIFT-BACK to resume editing the display.

For more information about patterns and dash styles, consult the documentation for the advanced graphic styles supported by the L1PP.

Locate Mode

As you enter test items, you will be in either text mode or graphics mode whenever you are adding elements to the display. This would be sufficient if you never need to change parts you have entered previously. Locate mode is the part of the system you use to edit specific parts of items.

Locate mode is characterized by the large "L"-shaped indicator on the screen. The words "Locate Mode" are also displayed at the top of the screen (Figure 16).

Figure 16. **Locate Mode**

You will get into locate mode when you indicate that you are finished entering new parts (by pressing either SHIFT-BACK or pressing SHIFT-NEXT before entering anything in a new item part). You will also be put into locate mode if you choose to edit an existing complete item from the Master Item List.

When in locate mode, press NEXT to move the locate indicator forward; press BACK to move it backward.

When in locate mode you can:

- move the locate indicator to a specific item part and press EDIT. You will be able to change what is stored in that item part. (See *Editing Displays* on page 28.)
- press DATA to see (and set) display settings. This option lets you specify a character set or lineset to use for this item, set background and foreground colors, and associate a graphic display with this item. (See *Shared Graphic Resources* on page 30.)

- press LAB to specify answer/ordering and judging options.
- press SHIFT-NEXT to insert a new item part immediately after the part marked by the indicator.
- press SHIFT-EDIT to delete the item part marked by the indicator.
- exit locate mode by pressing SHIFT-BACK to go to the Master Item List or SHIFT-LAB to go directly to the next item.

Editing Displays

The previous section indicated how you can use locate mode to indicate that you want to change an item part that has been stored previously. When you select an item part to edit, a number of possible things may happen:

1. If the item part contains only text (entered as a single element), you will be routed to text mode to edit that text.

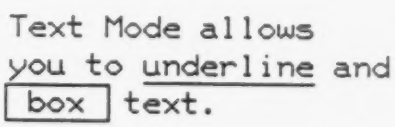
2. If the item part contains both text and graphics, but text was the first thing entered, you will be routed to text mode to edit that text element.

3. If the item part contains graphics (which might include text) and something other than text was entered first, you will be routed to graphics mode.

Editing in Text Mode

To understand how to edit text, you must first know how text is marked in the editor. Blocks of text are divided into sub-parts. Text sub-parts begin at the start of each line of text. If there are no changes in text styles in the line, the whole line of text is one sub-part. Otherwise, each change in text style starts a new sub-part.

This text:



has six sub-parts:

1. "Text Mode allows"
2. "you to "
3. "underline"
4. " and"
5. " box "
6. " text."

When you edit text, you press NEXT and BACK to move forward and backward through the text. Each key press moves the text cursor either forward or backward one sub-part. The sub-part currently indicated by the text cursor is erased from the screen. If you continue pressing NEXT or BACK without typing other characters, the copy of that sub-part will be restored. If you type something else before continuing to move through the text, the characters you type will replace what was stored at the location previously.

If you press SHIFT-HELP, the sub-part currently selected will be deleted.

Editing Graphics

In text mode, you used NEXT and BACK to move between sub-parts of the text; in graphics mode, you use the same keys to move between the distinct graphic elements in the part you are editing. As you press these keys, the graphics cursor (+) will move from item to item. The current element type (e.g., line, box, etc.) will be displayed in the lower right corner (*end* indicates the end of the list of objects). Fractions are stored as a combination of text elements and lines, so you won't see objects identified as *fractions* as you move around on the display. Rather, you will see each individual part of the fraction marked as *text* or *line*.

You can either change the selected item (press EDIT) or change the entire item part (press SHIFT-EDIT). In either case, *Change* only allows three options: delete the selection, move the selection, or center the selection (Figure 17). If the selection happens to be text, you also have the option of editing that text.

Figure 17. **Change Options**

Storing Changes

When you want to stop editing the item part, press SHIFT-BACK. You will be returned to Locate Mode with the locate indicator at the item part you just edited. Your changes will be stored.

Shared Graphic Resources

Often a portion of a display will be the same for a large number of items. It is inefficient to create multiple copies of the same displays. *Testing 1-2-3* uses shared graphic resources to facilitate creating these items.

Graphic Resources List

To access the graphic resources in your test file, press *g* from the Main Menu (edit *GRAPHICS*). You will be taken to the Graphic Resources List (Figure 18). This list is formatted identically to the Master Item List. The only difference is that it lists graphic resources rather than items.

Figure 18. **Graphic Resources List**

The same procedure used to create items is used to create graphics. Each graphic has a unique number and a 15-character name. The graphic can contain text only or a combination of text and graphics.

Multiple-Page Graphic Resources

A single graphic can span several pages. This is especially useful when test items refer to a reading passage. When students take tests with a multi-page passage, they will be able to look at all the pages of the passage while the question remains on the screen.

To create a multi-page graphic:

1. create the first page as usual.

2. press SHIFT-BACK or SHIFT-NEXT when done with the page. (You should see the locate indicator on the screen.)

3. press SHIFT-NEXT to insert a new page after the current page. (You will be taken to a blank screen to start continuing the display.)

When to Use Graphic Resources

Knowing when to use graphic resources to your best advantage will come with experience with the system. Here are a few examples to help you think about how graphics can be used:

- Reading passages that are too long to fit on a single display or about which several questions are asked.

- A cartesian plane for graphing equations. The equations that change from item to item are part of the item stem, which is plotted on top of the shared grid.

- Special instructions that apply to many questions and should be shown on each item display.

- Graphs and pictures that you may want to use several times.

Associating a Graphic Resource with an Item

To make the link between an item and a graphic resource:

1. note the number of the graphic you wish to use.

2. go to the Master Item List, select the item and move to Locate Mode.

3. press DATA to see display settings.

4. press *G* to set the graphic resource.

5. type the number of the graphic resource an press NEXT.

6. (optional) press *E* to toggle the *Erase graphic always* option. If set to no, the graphic will no be erased between two consecutive items sharing the same graphic; if set to yes, the graphic will always be erased between items.

7. press SHIFT-BACK. The graphic resource will now be displayed.

Graphic resources are always displayed at the top of the screen. They cannot by relocated.

Section Pages

Section pages are displays that can be inserted in a test. They are just like items, except that no responses are associated with them, and they are organized in their own list.

To create section pages, choose option *s* (edit *SECTIONS*) from the main menu. This will take you to the Section Pages List, which is structured and works like the Master Item List and the Graphic Resources List. You can use both text and graphics on section pages (Figure 19).

Introduction
In each of the following items, there is a short reading passage. Read this passage carefully before attempting to answer the questions.
Work carefully! Once you answer a question and move on, you will not be able to go back and change your answer.
SHIFT-NEXT move forward

Figure 19. **Section Page**

Tests

After you have created your test items, you are ready to gather the items into tests. Each test file can contain up to 60 individual tests. Each item may appear in several different tests, but can only appear once within a single test.

To create a test, first press *t* (edit *TESTS*) from the main menu. You will be taken to the Test List (Figure 20). The Test List contains all the tests stored in the test file.

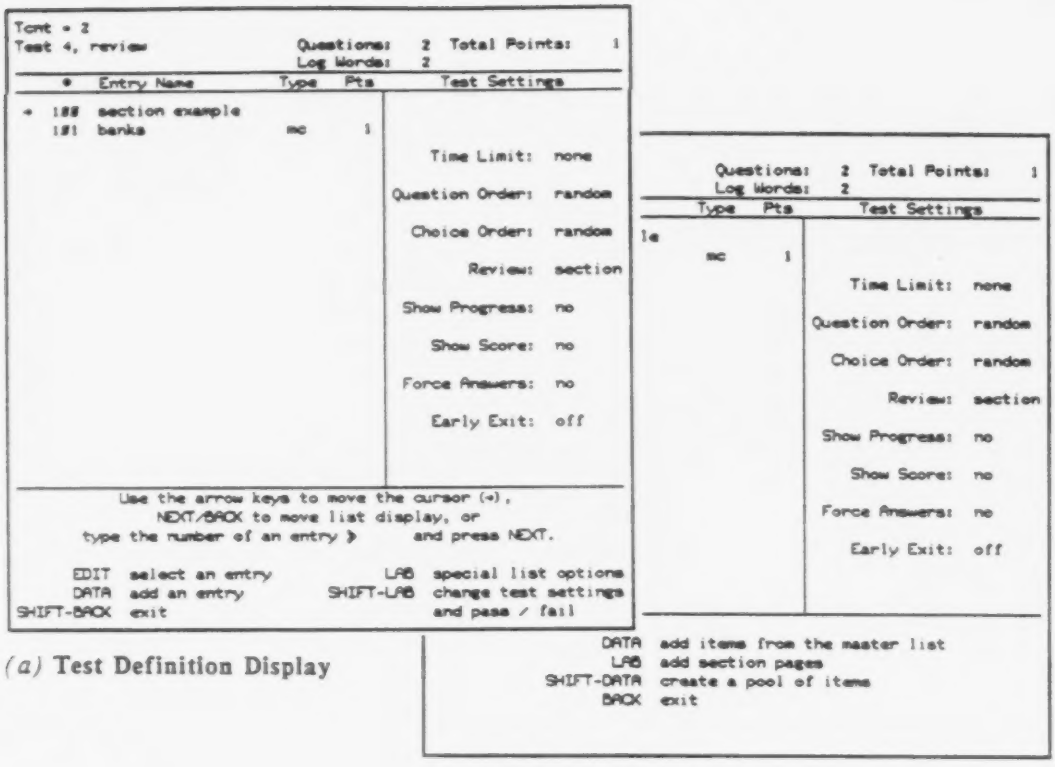
Figure 20. **Test List**

Tests are numbered consecutively, starting with #1. Test names of the form *Test 1* are given automatically. You can change this name later.

Press DATA to add a new test.

Test Definition Display

When you add a new test, a test will be set up for you in the next available slot. Figure 21a shows the Test Definition display. It is from this display that you build your tests and set all the controls that will affect how the test is delivered and scored.


Tcnt = 2
Test 4, review
Questions: 2 Total Points: 1
Log Words: 2
* Entry Name Type Pts Test Settings
* 1## section example
1#1 banks mc 1
Time Limit: none
Question Order: random
Choice Order: random
Review: section
Show Progress: no
Show Score: no
Force Answers: no
Early Exit: off
Use the arrow keys to move the cursor (+),
NEXT/BACK to move list display, or
type the number of an entry) and press NEXT.
EDIT select an entry
DATA add an entry
SHIFT-BACK exit
LAB special list options
SHIFT-LAB change test settings
and pass / fail
DATA add items from the master list
LAB add section pages
SHIFT-DATA create a pool of items
BACK exit

(a) **Test Definition Display**

(b) **Add an Entry Options**

Figure 21. **Adding Items to a Test**

Information about the test is displayed at the top of the Test Definition page:

- test number and test name
- number of items in test (including sections)
- the total points for the test
- Log Words is an indicator of how much storage space will be needed to store the students' answers for later. (Log Words are particularly important when building tests for delivery in *SYS 4*.)

Adding Items to a Test

To add items to a test:

1. when viewing the Test Definition display, press DATA to add an entry. You will be given a choice of what kind of entry you wish to add (Figure 21a).

2. press DATA to add items. You will be taken to the Master Item List.

3. use the NovaNET cursor movement keys (Figure 11) to move the item indicator to an item you wish to add to the test.

4. press DATA to mark this item. A diamond will indicate marked items.

5. to mark more items, repeat steps #3 and #4.

6. press SHIFT-DATA to add the marked items to the test. You will be returned to the test definition display; the items you just marked will be listed. Items will appear in the test definition list in the order you marked them on the Master Item List (NOT according to their item number).

7. repeat this whole process to add more items to the test. Items added to a test list will be inserted after the item marked by the item indicator. Place that indicator at the desired location in the list before pressing DATA to add more entries.

Items are listed on the test definition list by number, name, and type. The point value for each item is also indicated. The assumed point value for items is 1.

Adding Sections to a Test

To add sections:

1. press DATA to add an entry.

2. press LAB to add section pages (Figure 21b).

3. follow the process listed above for marking and adding items.

Adding Pools of Items to a Test

When you add specific items to the test definition as described above, those specific items will be given to every student who takes the test. Sometimes, it makes sense to have multiple equivalent forms of a test so that each student gets different items, and so that a student repeating a test will have a different version.

This test structure is accomplished through the use of *Pools*. When you create a pool, you set up a group of items from which specific items will be drawn when a test is given.

To add an item pool to a test:

1. press DATA to add an entry to the test.

2. press SHIFT-DATA to create a pool of items (Figure 21b).

3. type a name that will help you identify this pool. (The name can be up to 15 characters long.) Press NEXT. You'll be taken to the Pool Definition Display (Figure 22). The pool list is structured similarly to the test definition list.

4. press DATA to add an entry.

5. mark items as described in the section for adding items directly to the test: move the item indicator, press DATA to mark an item, and press SHIFT-DATA to add all the marked items to the pool.

6. set pool settings (see *Customizing Tests* on page 38).

7. press SHIFT-BACK to return to the test definition display. Pools are listed along with the other items in the test. Instead of an item number, the list shows *pool* in that column on the display. Instead of a type indicator, the list shows how many items will be drawn from that pool. This number is included in the *Questions* total displayed at the top of the screen.

At this point, the test is complete and ready to be administered. It will be delivered and judged according to the preset test and pool settings.

pool: peary
entries: 5
Entry Name Type
→ 1#2 peary mc 1
1#3 peary mc 1
1#4 peary mc 1
1#5 peary mc 1
1#6 peary mc 1
Pool Settings
Items Selected: All
Points/Question: 1
Track Letter: None
Group Items: yes
Display Order: random
Use the arrow keys to move the cursor (→),
NEXT/BACK to move list display, or
type the number of an entry ❯ and press NEXT.
EDIT select an entry
DATA add an entry
SHIFT-BACK exit
LAB special list options
SHIFT-LAB change pool settings

Figure 22. **Pool Definition Display**

Special List Options

Special list options on the Test Definition and Pool Definition Displays allow you to rearrange and change the item lists. The options are identical in both contexts and will be described once.

To delete or rearrange items from the definition lists:

1. press LAB from the definition display for *special list options*.

2. use the cursor movement keys to move the item indicator; press DATA to mark entries (press DATA again to unmark an entry).

3. to move the marked items, move the item indicator to the new location and press SHIFT-NEXT. All the marked items will be gathered together and listed at the place you selected.

4. to delete marked items, press SHIFT-HELP.

Options from the Tests List

As on the other listing screens, the arrow indicator is used to mark entries. When the arrow is pointing to the item you want, press EDIT. You will be given the following options:

EDIT	Edit the Test Definition Display.
LAB	Rename the test.
SHIFT-HELP	Delete the test.
COPY	Make a copy of the test.
SHIFT-DATA	Execute the test to see how it will be administered to a student.

Customizing Tests

Pool Settings

Each pool is managed and delivered according to the following settings:

Items Selected. Number of items to select from this pool. The preset value is **All**. Type a number of items to select.

If you enter a specific number, that number of items will be drawn from the pool. Suppose you have a pool with a total of eight items. It is important to note that the **All** setting is not necessarily the same as entering **8** as the number of items to select. Once you enter **8**, there will always be eight items selected, even if you add items to the pool. If **All** is selected, the number of items selected will always match the size of the pool. To set this setting to **All**, enter **0**.

Points/Question. Enter the number of points to be awarded for each correct answer. Initial value is set to 1.

Track Letter. Tracks are groupings of test items. They are used for expanding the information gained from examining test scores. Any combinations of entries in a test can be included in a track (all items in a pool must be in the same track). Testing judgments can be made based on overall test performance or on the results of a specific track. There can be up to 26 tracks defined for each test.

To set a track for a pool, enter a track letter from **a-z**. Initially, items and pools are not assigned to tracks.

Group Items. When the test is delivered to the student, the items drawn from each pool can be presented in a group, or they may be spread throughout the test. **yes**, the initial value for this setting, will group items; **no** will mean that items will be distributed randomly throughout the test. Press *G* to toggle between **yes** and **no**.

Display Order. Items in the pool may be delivered in **random** sequence, or they may be administered in the **fixed** order in which you marked them when you created this pool. Press *D* to toggle between **random** and **fixed**.

Press SHIFT-LAB from the pool list to change pool settings; then press the underlined letter of the option you wish to change. Press SHIFT-HELP to restore all the initial settings. Press BACK to store the current settings.

Test Settings

Just as pool settings specify how pools will be organized, test settings specify the various options for customizing the delivery of your tests.

Time Limit. Specify a time in minutes for the student to complete the test. An on-screen clock will tell the student how much time is remaining. When time runs out, the test will be graded. Initially, tests are set without a time limit.

Question Order. Items in the test may be delivered in the **fixed** order they appear in the list, or they can be in **random** order. Press *Q* to toggle between **random** and **fixed**. Tests are set initially to be randomly ordered.

Choice Order. This test-wide setting allows you to set the randomization of multiple choice and multiple selection responses to be **random** (default setting) or **fixed**.

Review. This option specifies to what extent students can go back to items they have already answered and change that answer. This setting has three possible values: **test, section,** and **none**. If set to **test**, students have free access to change any of the questions they have answered. If this option is set to **section**, students can review freely in the current section; once they move to the next section, the previous section is closed. (Sections are defined within the test by boundaries established by section pages.) The **none** setting means that students can never go back to an item once it has been seen. The initial setting is **sections**.

Show Progress. If this option is set to **yes**, a graphic progress indicator will be shown on the student's screen showing the relative proportion of answered questions to the number of questions yet to be answered. The default is **no**.

Show Score. You can decide to display the student's score immediately or not. If set to **no**, the student will be returned to the router without seeing the score. This allows the routing package to interpret the results as necessary before reporting to the student. The initial setting is **no**.

Force Answers. If this option is set to **yes**, the student will not be able to have the test graded until an answer is given for every item. This is set initially to **no**.

To change the test settings, press SHIFT-LAB. Then press the underlined letter to change a setting. Press SHIFT-HELP to reset all the options to the initial settings. Press BACK to update the new values.

Setting Point Values and Track Letters

The pool settings allow you to specify a track letter and point values for the items in a pool. You can also set these individually for each item in the test.

To set point values:

1. move the item indicator to the item and press EDIT.
2. press DATA to change point value.
3. type a new point value and press NEXT. The new point value will be displayed in the test definition list.

To specify tracks for individual items:

1. move the item indicator to the item and press EDIT.

2. press SHIFT-DATA to change track information. The column on the display which shows point values will be rewritten to display track letters.

3. press the new track letter (a-z) to set a track; press NEXT alone for "no track".

Adjusting the Pass/Fail Criteria

The judging mechanism derives a total percentage score for the test overall. In addition, it provides a pass/fail judgment on the test as a whole and for up to 26 tracks. There are three possible outcomes of judgment: pass (the student's score met the passing criterion), fail (the student's score was below the failing criterion), and unknown (the student's score fell somewhere between the passing and failing criteria). If the passing and failing criteria are the same, then there will be no *unknown* judging outcome. The initial setting is 80% passing, with no "unknown" judgment range.

To set pass/fail criteria:

1. while viewing the test definition list, press SHIFT-LAB to change test settings and pass/fail criteria.

2. press SHIFT-DATA to change pass/fail criteria.

3. press DATA to set overall criteria; press a letter to set the criteria for that track. You will enter two numbers: one for pass and one for fail.

SHIFT-DATA sets the criteria for all tracks to the overall values; SHIFT-HELP resets all values to 80%. Press SHIFT-BACK to exit. Press BACK to return to the test definition list.

SYS 4 Tests

If you are writing tests to be used as pretests and posttests inside the *SYS 4* Management System, follow these additional guidelines:

- Use file *xtstedit* as the test editor (instead of *tstedit*).
- When you create a test, you will need to specify whether you are writing a pretest or a posttest. Pretests are assigned numbers ranging from 1 to 30; posttests range from 31-60. Thus, Test #2 is the pretest for Unit 2; Test #32 is the posttest for Unit 2. Tests for different curricula should be kept in separate files.
- Log Words for any test must not exceed 29 words to ensure that the instructor can view all the student responses.

Assigning Tests to Students

Testing 1-2-3 and Routers

Tests are assigned to students by specifying the test file name and number as a lesson from the student's router. The student may be working in *SYS 4*, *C-router*, or a specialized router or management system.

Using *Testing 1-2-3* tests within *SYS 4* or from specialized routers requires discussion beyond the scope of this manual. To use the system within either of these contexts, contact the authors.

Assigning Tests within C-router

While editing modules, use the L directive to add a test to the curriculum. Enter the test file name (i.e., the filename of the nameset that contains your items and tests) as the lesson name. Include the number of the specific test you wish to assign as a parameter following the test file name.

For example, to assign test #4 in test file *sampletest*, you would type *sampletest(4)* as the assigned lesson. After the student completes a test, the overall score for the test and individual track scores will be stored automatically with the student data.

If the instructor will need to view specific student test responses at a later date, an additional nameset to store this data will be required. For more information, consult the *User Manual for C-router Instructors* (October 1989 revision or later).